



MIND & LIFE

Mind & Life Podcast Transcript David Creswell – Exploring Equanimity

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Opening Quote – David Creswell (00:00:03): *Something about learning how to be non-reactive to your experience, more open to your experience, seems to translate into you, I think, catching more positive emotional moments in your daily life. But it's not just positive experience. It seems to rewire people's social experiences as well. So learning these acceptance and equanimity skills makes people less lonely and increases the number of their meaningful social interactions each day. And to be more curious about your experience, I think makes you more open to being curious about others. And so these skills, they may help you manage your stress more effectively and provide social and emotional benefits.*

Intro – Wendy Hasenkamp (00:00:45): Welcome to Mind & Life. I'm Wendy Hasenkamp. Today I'm speaking with social psychologist and contemplative neuroscientist David Creswell. David is a professor of psychology and neuroscience at Carnegie Mellon University and a longtime member of the contemplative science community. He's been studying the effects of meditation on stress and resilience for over a decade and has conducted some of the most rigorous studies to date, piecing apart the different aspects of mindfulness interventions and figuring out which ones bring benefit and how.

(00:01:20) As you'll hear in this episode, he's been focusing a lot lately on the idea of equanimity. That's the way we can meet our experience without harsh judgment or a kind of "pushing away," but rather accepting what is, in the present moment. David nuances this concept a lot more in our conversation, and we get into some of the very cool ways he's parsed this out with what are called dismantling studies. He describes his findings about how an attitude of equanimity has measurable effects for our emotions and our physiological stress response.

(00:01:54) He also shares what he's learned about meditation's effects on the brain. We talk about neuroplasticity and importantly, how brain changes relate to changes in people's lives, clinical outcomes and so forth. (That's a connection that's been largely missing in brain studies of meditation. I think it's really crucial for moving the field forward. People have long been fascinated by the ways' meditation can change our brains, but what does that really mean for our daily lives?) And David also reflects on his work using apps to deliver mindfulness to broad and diverse populations, as well as the potential these apps can bring to the scientific study of meditation.

(00:02:33) I love how David approaches his research. He blends the most rigorous science with really meaningful outcomes, and he looks at how contemplative practice impacts both our psychology and our biology—our minds and our bodies. His findings around the importance of equanimity have huge implications for how we approach our suffering, no matter how that shows up for us. And as we heard

recently from Elissa Epel as well, stress resilience is a huge factor in our overall health and well-being. I think David's work sheds light on that in a new way.

[\(00:03:07\)](#) As always, check the show notes for more on David's work and a transcript of this episode. I was so pleased to have the chance to chat with him for this. I hope this conversation can give you a fresh perspective on meditation, and maybe a little reminder or motivation to bring more equanimity into your own life. All right. With that, it's my great pleasure to share with you David Creswell.

Wendy Hasenkamp [\(00:03:32\)](#): Well, it's my great pleasure to welcome David Creswell to the show. David, thanks so much for joining us.

David Creswell [\(00:03:39\)](#): Oh, I'm happy to be here.

Wendy Hasenkamp [\(00:03:40\)](#): I often like to start hearing people's backstory and how they got into the work that they're doing. So for you, I'm really curious what drew you to psychology and then also the contemplative space, and how those came together for you.

David Creswell [\(00:03:53\)](#): Oh, wonderful. We get to go way back, huh? So when I was a baby... *[laughter]* No, the story is, I grew up in Lincoln, Nebraska, as a professor's kid. And my senior year in high school, I had the great opportunity to take both a psychology class and a Buddhism class. I think it was my last semester of high school. So kind of an unusual set of opportunities for a younger kid. And I just loved the way that Buddhism was really bringing spirituality alive in people, and allowing them to practice these skills to make their lives better, to reduce their suffering and enhance their fulfillment. And I just loved that way of practicing spirituality in a way that could really give you a better life.

Wendy Hasenkamp [\(00:04:47\)](#): Did you have any spiritual background that you were raised with?

David Creswell [\(00:04:50\)](#): Yeah, I was brought up in the United Church of Christ, so a Christian background, more of a progressive kind of Christian theology type of background. And I remember sort of thinking at the time like, "Oh, that's cool, but man, this Buddhism stuff really speaks to me." And you can imagine being in the middle of the United States in the prairie there, sort of looking around and saying, "Is there a contemplative practice community here?" And surprisingly there is! There's a really well known Zen center in Omaha, Nebraska about an hour away. And they had some offshoots into Lincoln, where there were some practicing Zen Buddhists.

[\(00:05:31\)](#) And so I had this kind of cool exposure early on, to Buddhism. And at the same time was exposed to psychology and this science of human behavior, and ways that we could systematically study humans—and sort of seeing the parallels right away between these Buddhist contemplative practices, giving you an opportunity to study your experience, be a scientist of your experience, and then the tools of modern psychology.

[\(00:05:58\)](#) And as it turned out, in that psychology class, there was a capstone project that was part of the class. So they said, go out and do some research. And so I found this Zen Buddhist group right there in Lincoln, Nebraska. They had a sitting group, I don't know, it was on Wednesday nights or something. And my psychology project was to study the physiology of these folks during meditation. So I had a sample of a size of one. *[laughter]* So I found this one expert meditator. And I think I went to Walgreens

and bought a heart rate monitor for \$10 or something, and strapped this heart rate monitor to this... I talked this guy into letting me monitor his heart rate before, to during his meditation, to after.

(00:06:45) And I did this part of my psychology capstone project, saw his heart rate change—I think it changed like 15 beats a minute or something—and I remember being devastated. I think I had some expectation that his heart might stop while he was doing his meditation. *[laughter]* So as a young scientist, I got recalibrated a little bit to how this stuff actually works. And the joke goes is that, now some 30 years later, I'm still strapping heart rate monitors to meditators and studying physiological impacts. So I'm either really committed to this work, or I'm really just not creative at all. *[laughter]* So I stayed in the same track the entire career of my work.

(00:07:31) But it's just a real pleasure to be able to be a scientist in this space and to really study... A lot of what we do is studying how mindfulness interventions, mindfulness meditation practices, really change people's brains, change their physiology, change their experience, and change their health over time. And so it's just been wonderful, the more I get into this, the more questions I have. And so it's been a really wonderful path.

(00:08:00) So it started back in high school with studying Zen meditation, and I then went on to college. And then I went to graduate school at UCLA and got my PhD there in Social and Health Psychology. And in my first year of graduate school, I spoke to one of my mentors and I said, "Can I study meditation as like, a thing?" And he had previously done a lot of work in Transcendental Meditation and he said, "Yes, but you need to really apply the most rigorous methods to this work."

(00:08:34) And I've really taken that as my own sort of mantra with the science that we do, really pushing the most rigorous placebo-controlled trial approaches to studying mindfulness practices. And we still do that to this day. And I did that work at UCLA, I stayed on as a post-doctoral fellow in neuroscience and psychoneuroimmunology in the School of Medicine at UCLA for a year. And then in 2008, I started as an assistant professor at Carnegie Mellon University. And we've really been building out a lab doing clinical trials of mindfulness meditation training, really studying it as a form to understand what makes humans resilient under stress. And now I'm a full professor and trying to really support others and trainees in the lab, to give them the opportunities to push the science forward.

Wendy Hasenkamp (00:09:28): Fantastic. Well, I'm really excited to dig into the breadth of your work. I was just looking over some of your recent publications just in advance of this, and yeah, it spans so much. So I'm really excited to have you on the show and be able to share some of this work with our audience.

(00:09:44) You mentioned that stress can be a kind of umbrella over the different angles that you look at the effects of these types of contemplative interventions. So I thought maybe it would just be helpful to start... I think of course everybody has some sense of what stress is, and they experience it. But thinking about it as you said, you have such a rigorous approach to this work, which I really appreciate. So I just thought it might be helpful to think a little bit about stress and how you conceive of that, kind of how you define it for yourself in this space, and then why that is so important of a topic to be looking into.

David Creswell (00:10:24): Yeah, stress is a situation that we all experience on a fairly regular basis, oftentimes defined as "when the demands of this situation outweigh the resources that we have to cope." And for us, it can result in feelings of overwhelm, of uncertainty, and it results in this elegant biological cascade where you get increases in heart rate and blood pressure responses. You also get a

whole series of events that result in stress hormones like cortisol being elicited. And those physiological responses are so important, because they really help mobilize this effective fight-or-flight response. You can then summon some resources to really try to start to manage the situation. And this is all well and good except that, as many folks know, we oftentimes turn the stress response on thinking about this thing that might or might not happen in three weeks' time. So we have all sorts of ways with our clever brains to create stress, or increase stressors beyond the actual demands that are being put on us.

[\(00:11:40\)](#) So one of the things that we really have to work on is helping people build skills to really start to manage those stressors more effectively. And mindfulness interventions do a beautiful job of helping people first start to develop awareness around how they're responding or reacting in stressful situations, but also to teach us a set of skills that I often don't think get the credit that they deserve, around helping us better manage those situations. And in fact, one of the real focuses of the work that we've been doing the last couple years is on learning these acceptance and equanimity skills. So equanimity is sort of this buzzy term that's been getting a little more attention these days, which is great, but it's really this capacity to be non-reactive and non-judgmental to our experience.

[\(00:12:28\)](#) And in fact, mindfulness practices give us an opportunity to practice these non-reactivity skills. In fact, you can sit there and a couple minutes in, you might get that itch, or you might be thinking about dinner later, or having some other type of experience than paying attention to what you want to be paying attention to. And the goal is to sort of gently acknowledge where your mind has gone, and really foster this attitude of non-reactivity to the experience. So you're sort of doing these "equanimity reps" almost, right? You're practicing these skills in the moment, so that when you end your meditation session and you're going out into the world and you're dealing with some difficult stressor in the world, you've now got some new skills, some new muscle—I call it equanimity muscle—to really address those situations effectively.

[\(00:13:18\)](#) So I think this whole field of studying stress has been a wonderful place that we've lived in because mindfulness interventions really, I think, provide powerful skills for folks to not only acknowledge when they're dealing with stressors, but to more effectively manage those stressors. And when I put on my scientist's hat and say, "What are we offering to the world?" Well, when you look at studying stress and stress biology, there's this wonderful 130-year tradition of studying stress, and studying all the ways that stress can increase our health risks. So all the ways that stress can make us miserable. But there's been much less work looking at, well, what can we do to bring ourselves better to stressful experiences? And I think that's where contemplative practices and mindfulness interventions can really, I think, make a significant contribution. Because after all, if you look at the real heart of these practices, it's really about bringing a different approach to when we suffer. And if we can say stress is an example of suffering, there's a whole lot that these contemplative practices have to say about helping us build these reservoirs of resilience, as sort of a silver arrow to addressing these challenges.

[\(00:14:39\)](#) – *musical interlude* –

Wendy Hasenkamp [\(00:15:10\)](#): You spoke a little bit about the importance of acceptance and equanimity. And I feel like that's been such a huge avenue and importance of your work—of bringing that to the fore and really looking specifically about how that piece of these practices can make a difference. So maybe we can talk a little bit about your, what are called, dismantling trials. Maybe you can explain how that works from a research perspective, piecing apart the different aspects of an intervention. And then some of the findings that you've had around the importance of the acceptance piece.

David Creswell (00:15:42): Yeah, the last couple of years we've been really spending a lot of time doing these dismantling trials, where we start to take apart what we think are the active ingredients driving the stress reduction benefits of mindfulness interventions. And one of the principle active ingredients that we think may be driving these stress reduction benefits is learning these acceptance and equanimity skills—so really in that moment, when you're sitting there and you're feeling that itch or discomfort in your legs, and trying to bring an attitude of non-reactivity and curiosity to that experience. Folks who listen to this podcast commonly maybe doing meditation practices, and you've probably all had this experience of feeling some discomfort, some kind of benign suffering in your body or in your mind, and really trying to bring this attitude of curiosity, sort of welcoming that and not reacting to it as you normally might.

(00:16:44) This is, in my view, a way that people are doing these "equanimity reps." You're continuing to bring up this attitude of non-reactivity and curiosity to your experience. And that if you keep doing that over and over again, now when you're faced with new challenges, you can meet them with a much deeper sense of equanimity and non-reactivity. And for folks who've been on longer term meditation retreats, I like to talk about the bubble after you come out of a meditation retreat... and no matter what the world is throwing at you, you have this sort of smile. It's like, "Okay, there's some challenges that are occurring and creating suffering right now," and you don't have that same type of reactivity that you normally might. And I think that's a powerful lens into thinking about what these meditation practices are doing, and that learning these equanimity skills may be so important for helping us rewire our brains and rewire how we're responding to difficult stressors.

(00:17:43) So we've put that to the test with some of our clinical trials. And we do what's called a dismantling trial, where we basically offer full-blown mindfulness training in one group. So you're learning all these attention skills, learning how to pay attention when your mind wanders, to bring your attention back. But you're learning also all these acceptance and equanimity skills. So we're instructing people to be non-reactive and non-judgmental and to be really curious and welcoming to their experience. This is all standard stuff for mindfulness interventions. You get these attention training pieces, you get these equanimity skills training pieces, all well and good, standard mindfulness group.

Wendy Hasenkamp (00:18:21): And they're often just kind of blended, right? Those two pieces come together in a standard MBSR-type training?

David Creswell (00:18:28): Yeah, in MBSR, in most meditation contemplative traditions, they have these attention and equanimity pieces. I will say that a lot of times the acceptance and equanimity piece kind of comes on the back end. It's not something that... typically meditation teachers are talking about attention, when your mind wanders, bringing attention back. And then they sort of slip in this kind of equanimity language, like welcoming curiosity, non-reactivity, non-judgment. But it's not sort of spoken as a kind of explicit skill.

(00:19:00) And so a lot of what our science has been doing has been trying to elevate equanimity skills as just as important as the attention training skills that you might learn. But critically, so we have this standard mindfulness intervention where you have this blending of the attention and equanimity skills training. But then we have a second group, it's another mindfulness group, where we strip out all that acceptance and equanimity skills language. So you're still getting all that attention training. So really ground your attention in your present moment experience. When your mind wanders, notice where it's

wandered and bring it back. But we're not using the language around curiosity, welcoming, non-reactivity, all that kind of language that normally is that equanimity skills piece.

Wendy Hasenkamp (00:19:46): I wonder, is that... (You might be about to get into this, but) I'm just imagining training in that way without the piece of how you should approach the mind wandering or the thoughts that arise or the distractions. Can it be kind of difficult for people, if they're not reminded to get out of... There can be a lot of self-judgment, I feel like, of beating yourself up a little bit or like, I'm not doing this right. If you don't have the piece that's trying to counteract that, how do people fare from just that strict attention training?

David Creswell (00:20:20): Right. Well, the surprising thing is they love it. And they love it as much as the full-blown mindfulness training group.

Wendy Hasenkamp (00:20:29): Interesting.

David Creswell (00:20:29): So when we ask them about, how much do you think this is helping you in your day-to-day life, how much would you recommend this to friends and family, they're pretty equivalent in their ratings. Everyone really likes these programs. And so what we do know is that it seems to work well as a good placebo control condition. Namely that, the kind of positive treatment expectancies that you have between both programs seem to be equivalent, in terms of them saying, "Hey, I like this just as much."

Wendy Hasenkamp (00:20:58): Yeah, it's a great control.

David Creswell (00:20:59): Yeah, it's great. So it's a really nice comparison group, in that you've got that expectancies equivalence between the two groups. But I think you raised a question of, does it make the training harder? And I don't have direct data on this, because I think that's an interesting question, but what I might argue is the exact opposite, in that we're simplifying the instructions. And so it's very clear on, you know, when my attention wanders to bring that attention back, and it's about present mindedness. I don't have all this extra kind of attitude that I need to be working with. And so in some ways, the instructions do feel a little simpler.

(00:21:42) So anyway, I think it's a really interesting question, to sort of evaluate whether when you start dealing with discomfort, what happens in that space, right? And I don't have a good answer for you on that. I think that'd be a really cool... I can see some lab studies to do with that right now.

Wendy Hasenkamp (00:21:58): *[laughter]* I'll check back with you in a couple years, yeah.

David Creswell (00:21:59): Yeah, check back. Yes. So we've got these two groups. They're equivalent in terms of the amount of training that people are doing. So they're still doing the same amount of training. We've done this type of dismantling work with MBSR, Mindfulness-Based Stress Reduction. So this is an eight-week program where you're doing two-hour classes and 30 to 45 minutes of home practice every day. So we've actually created an MBSR program where we take out all the acceptance and equanimity skills language. And so we've done that trial. We've also done a trial where we do this on the smartphone. So we actually offer a digital mindfulness training where we dismantle these two pieces, namely taking out this acceptance and equanimity skills piece.

(00:22:45): And so our predictions in these trials are that, if you take out all this training in learning how to be non-reactive, non-judgmental, and curious to your experience, you're going to wipe out a lot of the benefits of mindfulness interventions. The neat thing about this work, and I think it speaks to one of my early mantras to getting into this science was, how can we do the most rigorous scientific work in this area? And our work is some of the first, I think, to now move beyond saying, "Does mindfulness training work better than relaxation training, or some other comparison group?" to saying, "Hey, which of these two forms of mindfulness training might produce better results?" So it's I think some of the more scientifically well-controlled work that's out there.

Wendy Hasenkamp (00:23:35): Yeah, I think it's beautiful work from a scientific perspective. And just to flesh out, for those in the audience who might not be used to thinking about study design and things like that, when you approach something like a mindfulness intervention from a scientific perspective, you're really interested in varying only one thing. And that's generally how science tries to work, is like, change one variable and see if there's a difference. But oftentimes that variable is the whole intervention. That's why we talk about active controls and like you said, something like a relaxation-based training that would be comparable, in terms of the time that you spend on it and you have some amount of relaxation, but maybe you're not getting the mindfulness. That's the part that is trying to be controlled for and varied. But in your case, it's even more nuanced, because you're doing a whole mindfulness training and you're just taking this one piece of it, this acceptance and equanimity training, and taking that out or putting it in and seeing the effect of that. So it really is a very fine-grained and beautifully elegant design that you've come up with.

David Creswell (00:24:38): Yeah. Well, I should tell you what the results are, and you can decide whether you still think it's interesting. *[laughter]* So we've done studies where we look at people's stress biology. So we have them go through these different training programs... And by the way, we do have, at least in some of our trials, another control group. So for the scientists listening to this, there are additional control groups to evaluate whether there's some incremental benefit to getting that attention training with your mindfulness program, relative to another type of relaxation training control group, for example.

(00:25:13) But in terms of outcomes, one of the first papers that we published in this space was looking at stress biology responses. So you go through these training programs and then we bring you into the lab. We have you give a difficult five-minute speech where you're talking about why you'd be a good job candidate. So you're talking about all these great things, and we have this evaluative panel. So we have these two people wearing white lab coats, looking really unimpressed with your performance. And then not only that, you do that for five minutes and then we have you do five minutes of difficult mental arithmetic, where you're counting backwards from 2083 by 17s. And then every time you mess up the evaluative panel is saying, "You made a mistake, please start over again at 2083."

Wendy Hasenkamp (00:25:59): Ugh, brutal.

David Creswell (00:26:00): Yeah, this is a standard social stress challenge task that people use. It's called the Trier Social Stress Test, it came out of the University of Trier in Germany. And it reliably gets people's stress responses moving. So you get increases in heart rate and blood pressure, and you also get increases in the stress hormone cortisol, which we can measure in people's saliva. So you can imagine going through this task and we can ask, "Well, is it the case that learning these acceptance and equanimity skills is a key driver for helping people manage this type of stressful experience? Does it change their stress biology in meaningful ways?"

[\(00:26:37\)](#) And the answer is yes. Even just 14 days of this type of training with a digital mindfulness meditation program was effective in terms of reducing people's cortisol and blood pressure reactivity to this task. And it did so significantly better than folks who just got attention training—so you're still getting this mindfulness program, but you no longer have those acceptance and equanimity skills. When we wipe that out, you don't see the same stress reduction benefits. So it really suggested to us that learning these acceptance and equanimity skills, even if it's fairly subtle, just sort of changing the language around having people working on welcoming, being non-reactive to experience...

Wendy Hasenkamp [\(00:27:17\)](#): And that's just in two weeks.

David Creswell [\(00:27:18\)](#): Just two weeks of training is producing these types of benefits. But here's the surprising thing is that we found that not only do we change people's stress biology, but learning these acceptance and equanimity skills seemed to leak over into people's daily lives in really meaningful ways. It seems to increase their positive emotions and happiness in daily life. So we had people complete surveys while they were sort of cruising through the day, just about how they felt right now. And we saw that learning these acceptance and equanimity skills seemed to increase people's positive emotions and their happiness.

Wendy Hasenkamp [\(00:27:52\)](#): Again, over and above just the attention training.

David Creswell [\(00:27:55\)](#): Yeah. So it's something about learning how to be non-reactive to your experience, more open to your experience, seems to translate into you, I think, catching more of these positive emotional moments in your daily life. Like I think it's sort of producing this kind of savoring experience. And certainly for those who've gone through meditation retreats and you get a big dose of practice, coming out on the other end lots of people report noticing lots more subtle experiences that are really positive. You kind of catch those more, and you're more open to those. And I think learning these acceptance and equanimity skills really opens that up.

[\(00:28:35\)](#) But it's not just positive experience. It seems to have really rewire people's social experiences as well. So learning these acceptance and equanimity skills makes people less lonely, and increases the number of their meaningful social interactions each day. So we have another paper that shows that we can really change people's social experience in really powerful ways.

[\(00:28:58\)](#) And so again, I think it's like, learning how to be non-reactive and non-judgmental to your experience and to be more curious about your experience, makes you more open to being curious about others and connecting with others. And so we're wanting to test this more, but some really promising, I think, work to suggest that these acceptance and equanimity skills, they may help you manage your stress more effectively, but they may [also] have all of these cool social emotional benefits in your daily life. They kind of leak over into helping you savor more positive experiences that you may have missed and make you more open to wanting to connect with others and feel socially connected.

[\(00:29:41\)](#) – *musical interlude* –

Wendy Hasenkamp [\(00:30:13\)](#): That's so interesting. I think there's a number of avenues in the contemplative space where there is this leaking over, as you said, or bleeding over into daily life, or other skills. So you're training this somehow foundational mental capacity or something, and then it's

just instantly applied in other realms of life. It's so interesting that you've been able to expand your research in those different directions, to social interactions.

David Creswell (00:30:40): You're right. It's so important. And I think a lot of times people who come to mindfulness practices or contemplative practices, they sit down, they're doing meditation, a couple minutes in, they start to notice some discomfort and they feel like they're doing meditation wrong. And what our science is really suggesting is that those moments of re-upping your non-reactivity, your curiosity, doing those mental reps with your attitude, actually may be the secret sauce. So I think a lot of people who are coming to meditation and churning out because they feel like they're doing it wrong, are actually missing the moment—a window of opportunity where leaning into discomfort and sort of saying yes to that discomfort and opening your experience to that discomfort, is actually the moment of transformation for our brains and our biology, because those are where you're really flexing those skills.

(00:31:42) And anyone who goes on a meditation retreat can probably attest to the fact that there's a lot of discomfort that you're working with over long periods of time, and that you're actually building this reservoir of resilience by doing that work. So a lot of what our science is doing is trying to help people to understand... I think a common misconception is like, "Oh, I must be doing this wrong," when in fact, those are the moments of when you're doing it right. And to the degree that we can give people the license to lean into those experiences, [that] may be the ticket to making mindfulness interventions more effective, and more lasting in terms of people's stress reduction and health.

Wendy Hasenkamp (00:32:25): Something you just said about this opportunity for transformation, and for us to re-pattern our brains and our mental patterns and physiological patterns—which I feel like is so much of what these practices are about, this repetition and opportunity to build new pathways—I feel like that's such a key part of stress reduction as well. I don't know if that's part of how you think about it, but I often think about, under stress you don't have a lot of extra resources available, and in order to re-pattern neural connections, it actually takes a lot of energy and biological resources to do that. And so that's another benefit I think—to be able to reduce stress allows for a little bit more free resources to then be able to do the work of the re-patterning that we're often trying to do in practice.

David Creswell (00:33:18): Yeah, I totally agree. And I think that when people are looking at changing their bodies, they're saying, okay, I need to start this exercise routine, and you sort of turn to that. And it's hard work, particularly initially. And I think that analogy works really well for really wanting to change our brains, and change the way that we're managing our suffering. And it's going to take some work. And I think these contemplative practices—not just mindfulness practices, but a whole host of them—give you this opportunity to create a context where there's benign discomforts, and really work with that. And so, you can look at the Zen tradition as a great example of like, let's make people suffer and work with it. But it's beautiful, because it creates a safe setting where you're not going to do any injury to your body or mind, and really allow these benign discomforts to occur, and for you to start to build these muscles. And just like exercise training, it's going to require some work. And particularly early on, as you start to do this, it's going to require work.

(00:34:24) But I think to your point, Wendy, it's kicking off this kind of neuroplasticity. This is what's changing people's brains and sort of rewiring connections in ways that are going to help you when you start to deal with major life stressors that occur to all of us. So why not practice now and practice in a way where... let's face it, there's also a lot with these mindfulness practices of deep fulfillment and insight and reward. It's not all pain. There's lots of wonderful moments there too.

[\(00:34:55\)](#) But I think what we've been trying to do with our science is sort of say, "Hey, those moments where you are suffering are actually wonderful windows of training, and can be a really transformative time for you if you can continue to keep bringing forth this attitude of welcoming, curiosity, and non-reactivity." And I know it's hard. That itch feels really uncomfortable or there's discomforts. And just like any good meditation teacher, the attitude is, let's just keep coming back to this attitude of non-reactivity. And if I need to start up again, okay, let's start over again, and let's bring this attitude again. And so hopefully that can help people. And I can certainly say that our science is moving forward into a space where we want to be studying these practices more.

Wendy Hasenkamp [\(00:35:44\)](#): Yeah, yeah. Well, you were speaking a little bit about brain changes, and I know you've done some great work in that area too. Do you want to share just a few of those findings?

David Creswell [\(00:35:55\)](#): Yeah. So one of the questions that we've had over the last decade is how is mindfulness meditation changing the brain that's driving all of these health benefits? And so we know a whole lot about mindfulness interventions, helping people with chronic pain, changing the immune system in ways that can help people with their health and wellness, changing people's substance abuse patterns if you've got some addictive disorder. And one of the questions we've had is just like, well, how do all of these health benefits occur? It has to be driven by the brain, right? Meditation training has to be changing people's brains in ways that's changing their health. And we've been building out what we call a stress buffering account, really saying that if you look at something like substance abuse disorders, chronic pain, the immune system, they're all highly stress sensitive. So these stress hormones that we've been talking about are key players in terms of either driving the onset or the exacerbation of all of these types of symptoms, whether that's relapsing with drugs, or changing the immune system, for example.

[\(00:37:02\)](#) And so we've turned to the brain to sort of look at this, and one of the things that we're seeing is that mindfulness interventions seem to really drive two significant brain changes that we think are important for explaining all these health benefits. One is that it seems to change activity and functional connectivity of the brain's prefrontal cortex. We know that prefrontal cortex plays an important role in goals and planning and emotion regulation. We know a whole lot about mindfulness interventions changing the prefrontal cortex, and we're finding that with mindfulness interventions, it seems to change how the prefrontal cortex seems to be connected with other networks that are important for driving people's emotions and stress responses. So we clearly are seeing some initial signal there with mindfulness interventions really targeting the prefrontal cortex.

[\(00:37:51\)](#) But we're also seeing a second pathway, and that's that mindfulness interventions seem to be turning down the brain's stress alarm system. So we're seeing a lot now, across a number of studies, where mindfulness interventions seem to be turning down the activity and functional connectivity of the amygdala—the amygdala being a really important region of the brain. This is sort of an almond shaped structure at the base of our brains that's a critical gatekeeper for gating the brain's kind of alarm system. And mindfulness interventions seem to turn down amygdala activity and functional connectivity. And even in some of our studies, some suggestion that it may be actually changing the structure structure of the amygdala. So this has really led us to start to theorize that mindfulness interventions not only are changing the top down prefrontal cortex role, but also sort of turn down the actual alarm system of the brain.

[\(00:38:49\)](#) So we think these are really two key brain pathways by which mindfulness interventions may be changing people's stress responses and stress related health over time, whether that's substance

abuse or chronic pain or the immune system, for example. But I think they're really promising pathways for thinking about how mindfulness interventions change the brain in ways that matter for health.

Wendy Hasenkamp (00:39:13): Yeah, the paper that I'm remembering around the prefrontal cortex was also, if I'm remembering correctly, related to its functional connectivity with the default mode network (or posterior cingulate, which is part of the default mode network). And this seems to be a pattern that shows up in a number of different studies around contemplative practice, that there seems to be an increase in the connectivity between prefrontal regions and default mode regions after training.

(00:39:39) And so that kind of makes me think... I'm weaving in here some ideas with predictive theories of mind and things like that. I think the default mode network is starting to be thought of, by some folks who think in these predictive models, as maintaining this higher level model of the world and of the self. And then prefrontal regions and more attentional regions are sometimes more related to present moment sensory information, or things like that. So there just seems to be this pattern in a number of different areas of study where these networks or systems are talking to each other more after practice. And so there's starting to be some idea that it's shifting the balance, or it's letting information in more to our models of the world so that we can maybe update them and not be stuck in these patterns. How does that land, in terms of the way you think about those networks?

David Creswell (00:40:37): Yeah, I mean maybe to speak to what the finding is, because I think that's important to kind of frame this, is that what we're finding is that, after a mindfulness intervention—by the way, this was a trial we ran, which was a retreat study. So we actually, we took the eight-week MBSR program and we condensed it down into a three-day residential retreat. So you could imagine coming on a Friday and staying through Sunday. And we took people's cell phones, and randomized them on site to a retreat program. It's actually wonderful for scientists because we really, we standardize the environment and we standardize the dose. So everyone's doing the same practice. As many people know, you do an eight-week MBSR program and some people are doing home practice and others are not. And so you've got essentially a different program for everybody. But in the case of retreats, you've got a really nice way to kind of control the environment.

(00:41:35) And we had a control group in that particular trial that was a relaxation group. So we had two groups that each came to a separate wing of this retreat center, north of Pittsburgh. And they gave away their cell phones and they committed to these three days. And one group got relaxation activities and the other group got these mindfulness meditation activities. So everyone's got a beautiful retreat experience with three hot meals a day, and a great support group and instructor. But critically, one group got the mindfulness training.

Wendy Hasenkamp (00:42:08): Again, a really lovely control, lovely design.

David Creswell (00:42:10): Yeah, it's great. I really like that study. I think there's something really powerful about retreat experiences for people learning these practices, and having that structure and support to really go deep. And folks really loved these retreat experiences, both groups really loved the programming. So that was great.

(00:42:30) But we did brain scans on people on the weeks before and weeks after this three-day intervention. And the observation that we observed was that the mindfulness group really showed these changes in how our resting brain, this default mode network, was connecting with regions and executive control networks that we know are important in emotion regulation. So it was almost like with

our mindfulness meditation group, we're really coupling one's resting brain with these kind of regions that are important in emotion regulation and top-down control. So we saw this, a number of other groups have seen this with mindfulness interventions, as this sort of internetwork coupling of resting brain with these regulatory regions of prefrontal cortex. For science nerds, this is the dorsolateral prefrontal cortex that we're really seeing this connectivity with. This is not something you typically see, this type of internetwork coupling.

[\(00:43:28\)](#) And I think what you're suggesting, Wendy, is there's a lot of ways to think about what this coupling means. I don't think we actually know right now. We just know that across all different types of mindfulness interventions... So they've done this in eight-week or 10-week programs with veterans. We recently did this with adolescents that were at risk for mood disorders. They've done this in healthy community adults, like an eight-week MBSR program. All these different types of mindfulness programs, we see the same type of internetwork coupling. So there's a real reliable signal here.

[\(00:44:03\)](#) And in all cases, that signal seems to matter for people's health and well-being. So in our three-day retreat study, we saw that this change in brain coupling was associated with improvements in inflammatory biology at four month follow up. In veterans, they see that this is associated with reductions in PTSD symptomatology. In healthy adults, they saw this correlated with changes in white matter connectivity—so this sort of functional coupling seems to be mapping on with structural changes in the brain. And when we look at this in the context of kids at risk for mood disorders, we find that it's associated with reductions in mood lability. So in all these cases, these brain changes seem to correlate in meaningful ways with improvements in health and well-being. So we've been really trying to say, "Hey, people need to study this more," and do exactly what you're suggesting, Wendy, is try to understand, what does this brain coupling mean in terms of changes in people's psychology and behavior?

[\(00:45:00\)](#) One fun story with this work is that we published our paper, this retreat paper, showing these changes in brain coupling. And it was picked up by the New York Times and got a lot of media attention for like, here's how meditation changes your brain. And it was great, and then the Today Show picked it up. So actually President Bush, George W. Bush's daughter, she was a correspondent at the Today Show, and she said, "Hey, I'm really into meditation. Can I come out to Carnegie Mellon where you did this trial? Can I get in the brain scanner, and can you teach me some meditation skills and we can see if we can get that same effect?" And I floated this idea to my marketing team at Carnegie Mellon and I said, "Hey, Today Show wants to come out and film a segment where we do this." And they were all like, "Ah, that seems kind of risky for you and your career. Are you sure you want to do this?" Because after all, it's just one person.

Wendy Hasenkamp [\(00:45:55\)](#): Yes, there's no guarantee that [effect] will happen.

David Creswell [\(00:45:56\)](#): This is not a three-day retreat, you know? But we agreed to do it. So she comes out, we give her a guided meditation session, and then we do this brain scan again. And sure enough, we get the same pattern of effects. We got this nice connectivity pattern with right dorsolateral prefrontal cortex, the same pattern we saw.

Wendy Hasenkamp [\(00:46:15\)](#): Wow, that's interesting.

David Creswell (00:46:16): So it was a high risk, high reward deal here, with an n of one. And anyway, they did film this as part of a Today Show segment. And it was a high stress period for us. It was an opportunity to practice these mindfulness skills. *[laughter]*

Wendy Hasenkamp (00:46:33): Oh, I can imagine. Well, that's really... that's a powerful demonstration. I mean, in some ways maybe lucky that it worked out with just one, an n of one, a one-shot. But still, yeah, to be able to induce measurable changes in one session maybe suggests that that's a real core process of what is being changed through that practice.

David Creswell (00:46:55): Yeah, and Wendy, I think some credit goes to a lot of your earlier research in this area, where you were using neuroimaging to study people's brain correlates to their experience, like when their mind wanders, for example, when they bring their mind back and sort of reset. And what I think we need to do is start to then extend this into these equanimity skills that people are learning. And then I think some of our science now really suggests that we have some places to look, for example in these changes in functional connectivity with the prefrontal cortex, as circuits that may be kind of brought online when people are doing these practices.

(00:47:31) – musical interlude –

Wendy Hasenkamp (00:47:55): You mentioned earlier that some of the research that you've done has involved apps and app-based delivery of these interventions. I know you've been doing more and more of that kind of digital platform work. Do you want to share your experiences there and what you're hoping to go towards with that?

David Creswell (00:48:12): Yeah. Oh man, this is such an important area. What we've seen in the last five years is just a transformation of the kind of digital therapeutic space. And there are millions of people every year that are looking for mindfulness meditation training programs via these apps, across the world. So I think there's tremendous opportunity here for us to be able to scale our mindfulness work in ways that were just never possible. We've been using MBSR for a very long time in my lab, and it's been wonderful. It's a great program, but it's also expensive and hard to scale sometimes. You know, I think about running a trial with 200 irritable bowel syndrome patients, or can I run it with 20,000 people with a digital app? And just thinking about the scaling opportunities.

(00:49:04) And I think platforms like Headspace and Calm and Waking Up, and frankly dozens of others have really shown that there's a hungry market out there for people that want to engage in these. The challenge has been really keeping people... creating an ecosystem for training these skills that's going to result in success, and result in outcomes. And I don't think we're there yet. I think the average lifetime use of Headspace or Calm is 2.5 lessons. So millions of people are downloading these apps and they're trying it for maybe a lesson or two, and then they're not continuing to use it. And so from a pragmatic or implementation science perspective, I feel like we're not there yet. We've sort of created Blackberries, but we need iPhones when it comes to these types of mindfulness training opportunities for folks.

(00:49:53) And so we've been spending a lot of time in my lab doing some of the initial science just to say, "Hey, these digital platforms can work, but you need to create ecosystems of success." And so two-and-a-half years ago, my lab started a company called Equa, (E-Q-U-A, it's short for equanimity) that really tries to spin out some of the science and approaches that we've learned that work to really help people. And I don't want to say that Equa is the answer to everybody's problems. I think there's a lot of great scientific groups that are working on these problems right now, but this is such an important

window of opportunity that I think we have as a contemplative science space—to use some of these new tools to really engage people in ways that can produce outcomes.

[\(00:50:39\)](#) And some of the things that we've been doing at Equa that I think are really exciting is we're making the training experience more interactive, so you're not just listening to some guided audio, but you're now interacting in ways that we can really help you when there's windows and walls that you're hitting in your practice. We know that meditation... I've sort of already highlighted this, but that learning these mindfulness skills is hard work. It's sort of exercise for the brain. And I think we need to find a way to help people build those skills, and when they're starting to fall off or struggle giving them the support that they need. And I think the digital platform space could be really uniquely poised to do that well.

[\(00:51:23\)](#) We're also building new biometric tracking, so ways to use your physiology to tell you when you're going deep with your meditation training. And I think that's going to be a real key. I always like to say people like to go to Orange Theory with their heart rate monitor on and get that feedback on how many peak heart rate minutes they're getting in their exercise. Well, why can't we build the same thing for people doing meditation training? Give them that feedback that is going to help them continue to grow and challenge themselves in learning these skills.

[\(00:51:53\)](#) And so, I don't know, I've found this space to be really fun and interesting and challenging to figure out how to build scalable training programs that are going to meet people where they are, and really help them. And so that's where we're going. I think a lot of the new science that we're pushing on in my lab is really focused on what I'd call these pragmatic trials or implementation science trials, where we're moving beyond, "Does this change people's brains? Does it change their physiology?" to tackling, I think, the harder problem of, "How do you create a supportive training system at scale for lots of people, that they can do on their own time in their own space?" And it's been a really fun problem to solve. And I hope if anything, this podcast will generate ways we can kind of come together as a contemplative science network to try to build these platforms, because a lot of people want this training.

Wendy Hasenkamp [\(00:52:48\)](#): Yeah, and I could see it as an opportunity to have a lot more daily life outcome measures as well. And not just things that you can measure in the lab, but experience sampling, or checking in with people about how they feel and some subjective measures, as well as physio. You said you were developing physio tracking. So to be able to move that out of the lab, I think is huge. Because of course, we all practice for changes in our daily lives, right, not so we can go in the lab and have some change. So that's fantastic.

[\(00:53:19\)](#) I wanted to circle back onto just the idea of acceptance and equanimity, and just flesh out one piece of nuance there, because I think sometimes those terms can be misinterpreted or applied in ways that maybe aren't appropriate. So how do you think about the stance of acceptance in the face of if harms are being done, or if you're actually in an unhealthy situation? You know, I think sometimes it can be interpreted like, "Oh, okay, I'm just going to accept that that's happening, and that's what it is." So yeah, can you flesh that out a little bit from your perspective?

David Creswell [\(00:53:55\)](#): Yeah. You're bringing up a really critical issue for this area. The way we've been thinking about acceptance and equanimity skills is really an attitude toward your *experience*, and not toward your situation. So in fact, teaching these acceptance and equanimity skills is really learning about how to work with your own experience and your own reactions to situations. And we think that

by learning these skills, it's actually going to make you a more agentic person in situations where you need to be proactive.

(00:54:29) And so it is not a sort of... I oftentimes talk about it as a passive resignation to your experience. Accepting is not giving up. It's about accepting, here's my experience right now. And then hopefully helping people then say, what do I want to do about that experience? Or what do I want to do about this situation?

(00:54:47) And this issue has been really endemic to our scientific study of acceptance since the beginning. So for folks who study stress and coping as a field, coping researchers early on talked about acceptance as being important, but they didn't really define it well. And I think it's created a real kind of confusion around what acceptance outcomes look like. Because it's easy to sort of confound this passive resignation—this sort of "giving up" form of acceptance—from more of a proactive like, I'm accepting and open to my experience and how I'm reacting to this situation. And so we've been really pushing hard on that and saying that we need to do a better job of really clarifying what acceptance and equanimity mean.

(00:55:33) And I would venture to guess, although we haven't done this work yet, that learning these equanimity skills—this non-reactivity and openness to your experience—is going to allow you in difficult situations to be a more proactive problem solver for those experiences and that it's actually going to result in you being able to manage the situation more effectively, as opposed to giving up on that situation. So, not something we've tested, but I think you could say indirectly... mindfulness interventions have been shown to increase pro-social behavior, for example. You help someone that's got a broken leg and doesn't have a seat to sit on. If you go through a mindfulness intervention, you're more likely to give up your seat and help that person. And maybe these acceptance and equanimity skills in that case are critical for driving those types of outcomes. Anyway, yet another study to run.

Wendy Hasenkamp (00:56:26): Yeah, that would be great to be able to piece apart. Thanks for sharing that nuance.

(00:56:32) As I step back from your body of work, and thinking about the stress resilience and all these different pathways that you've looked into, I so appreciate how you have really been able to look both at the biology, the physiology, as well as the psychology and the subjective side of things. I think that's such a lovely weaving that you've done, and I'm just wondering if you have thoughts there. As I was thinking about that, I was then thinking, "Oh, well of course, they're not even really two different things. They're kind of two sides of the same coin." But how have you come to think about biology and subjective experience, or those two pieces?

David Creswell (00:57:17): Yeah, I mean, they're all part of the same people that we're studying. And I think you're right. My research really hasn't privileged one over the other. And most of the research that we've been trying to do has been trying to figure out ways to do the linkage work. So really showing how changes in our biology may be driving changes in our psychology and behavior, and vice versa. And that's harder work. But I think it's so important, because your subjective experience of how you're managing your suffering, I think is just as important as how your brain is changing. And in fact, they may be two sides of the same coin in terms of understanding people.

(00:58:04) And I think it all comes back to my really early interests and just being kind of puzzled and amazed that sitting down and paying attention to your experience in a meditation practice could

translate into all of these health benefits. And just like, how is that happening? And to study the brain and our biology and not our subjective experience, we'd really miss a big piece of trying to understand that larger puzzle.

(00:58:31) And so we've been trying to do that work and try to capture these things in their beauty. And it certainly is a beautiful process to be able to study how we have these ancient practices that are so simple but yet so nuanced that can really, I think, transform people's lives, change their suffering, and increase their fulfillment in just really amazing, profound ways. And to be able to be part of the science that gets to kind of unpack those things has been a real joy in my life. And so we've still got a lot of work to do in terms of trying to understand these practices, but to the degree that we can really, I think, work across these systems—our brain, our biology, our psychology, and our sociology—I think is just going to be so important to really understanding how these things work. Because they don't work in isolation, and we have to put the full puzzle together.

Wendy Hasenkamp (00:59:32): Yeah, I love it. It really highlights the interconnectedness between all of these different lenses. And really at the end of the day, I feel like they're all different ways of looking at mind, and just how minds are expressed in our bodies and in the world. Well, this has been such a rich conversation. Do you have anything that we haven't touched on that you want to speak about? Or do you have take home messages from your experience for the audience?

David Creswell (01:00:00): Yeah, I mean, I think it's great to look at the science and have it be a tailwind on getting you to practice or to try it, but I think the real value is in getting out there and doing these practices. And I hope that the work that we've done has kind of helped people move along that pathway to trying things out or re-engaging again. Or maybe, for some folks listening, to try mindfulness practices for the first time. That to me would be, I think a sign for success because a lot of the work that we've been doing shows that there's a real dose-response effect here—namely that, to the degree you can be engaging these practices and doing more of these practices, you're going to see benefits. And those benefits seem to be wide-ranging. So I just hope folks will give it a shot, and report back.

Wendy Hasenkamp (01:00:56): Well, thanks so much, David. This has been great. Thank you for all of your beautiful work in this space, and thanks for taking the time to chat with us today.

David Creswell (01:01:04): Thanks, Wendy.

Outro – Wendy Hasenkamp (01:01:09): *This episode was edited and produced by me and Phil Walker, and music on the show is from Blue Dot Sessions and Universal. Show notes and resources for this and other episodes can be found at podcast.mindandlife.org. If you enjoyed this episode, please rate and review us on Apple Podcasts, and share it with a friend. And if something in this conversation sparked insight for you, let us know. You can send an email or voice memo to podcast@mindandlife.org.*

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